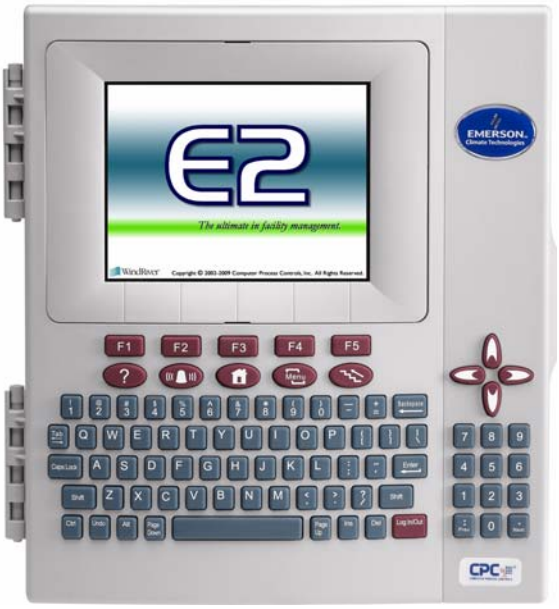
026-1711 Rev 2 06-29-09

Square D Smart Breaker Panel Control Manual



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1 Overview

1.1. The Smart Breaker System

The Smart Breaker products are designed to allow the Retail Solutions family of site controllers (RE-FLECS, Einstein, and E2) to command control panels that activate and deactivate lights. A breaker panel generally consists of a series of circuit breakers that are flipped from OFF to ON and from ON to OFF by commands sent from E2 through MODBUS or a Square D Smart Breaker Gateway board. Support for proof checking on individual breakers is also supported.

The Retail Solutions line of Smart Breaker products include E2 direct MODBUS support or a Gateway for interfacing with Square D's Powerlink G3 breaker panels.

1.2. Breaker Numbering on the Square D Master and Slave Panels

Figure 1-1 shows the numbering for all breaker slots on the Square D Powerlink panels (24-breaker panel shown), as they correspond to the breaker numbers mapped to groups in the HHT screen (see **Section 3.6.1.2., *Configuration***). For the master panel (Panel #0), the odd-numbered breakers are on the same rail as the power supply, and the even-numbered breakers are on the opposite rail. For slave panels, the odd-numbered breakers are on the same rail as the address selector, and the even-numbered breakers are on the opposite rail. In either case, all breakers are numbered in ascending order from the side closest the power supply or address selector to the opposite end of the rail.

1.2.1. Numbering Double and Triple Breakers

If double or triple breakers are being used in the Square D Master and Slave panels, they will be plugged into more than one slot on the Square D Powerlink panel. However, double and triple breakers only respond to ON/OFF commands sent to one of its address slots.

Double breakers occupy two slots in a Square D Panel. If a double breaker is on the left side of the panel use its first slot for the control address, and if on the right side of the panel, use its second slot for the control address. For example, if a double breaker is on the left in slots 3 and 5, the breaker address slot will be 3. If a double breaker is on the right in slots 4 and 6, the breaker address slot will be 6.

For triple breakers, use the center slot as the breaker address, as this will be the same for the left and right side of the panel. For both double and triple breakers, all unused slots should be left unaddressed (i.e, assigned to Group #0 in the Gateway or unassigned with E2 direct MODBUS control).

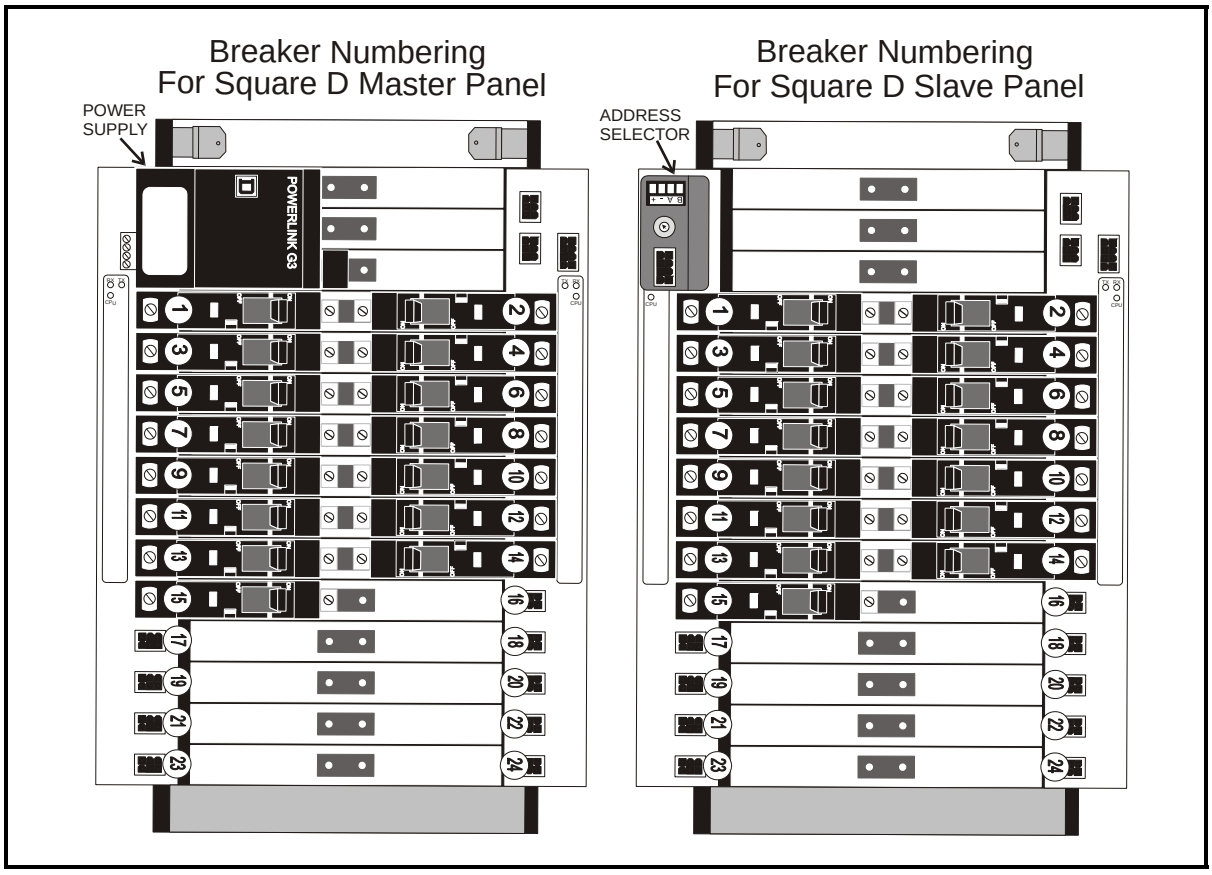


Figure 1-1 *- MODBUS Gateway to Square D Panel Wiring*

1.3. The Square D Powerlink Breaker Panel

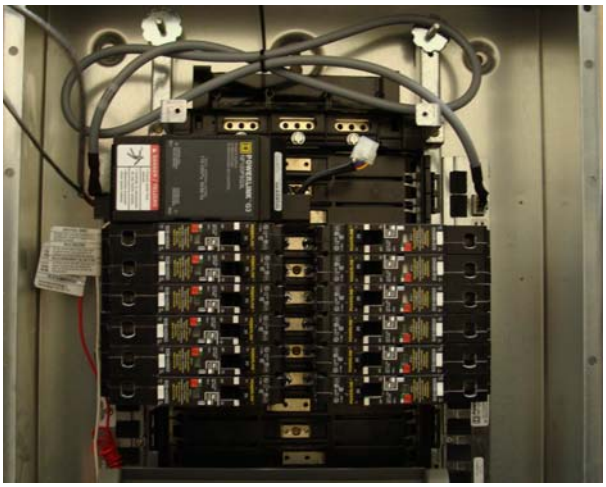


Figure 1-2 *- Square D Powerlink Breaker Panel (24-Breaker Version Pictured)*

The **Square D Powerlink breaker panels** are driven by an on-board power supply that handles staggered activation of breakers, proof checking and autoreset. Retail Solutions site controllers communicate with the Square D Powerlink panels via its MODBUS network connection. The Retail Solutions controller directly commands the Square D Powerlink panel to turn its breakers to turn ON or OFF.

A Powerlink panel consists of two rails of breakers consisting of either 6, 9, 12, 15, 18, 21, or 24 breaker slots each, for a total of 12, 18, 24, 30, 36, 42, or 48 breakers.

1.3.1. Compatible Square D Panels

The E2 Square D Smart Breaker system requires one “master” panel to be equipped with a Powerlink G3 power supply module (see ***Table 1-1*** for part numbers).

Square D Part #	Description
NF120PSG3	Powerlink G3 Power Supply, 120V
NF240PSG3	Powerlink G3 Power Supply, 220/240V
NF277PSG3	Powerlink G3 Power Supply, 277V

Table 1-1 *- Square D Powerlink G3 Power Supplies*

The E2 Square D Smart Breaker system does NOT require, and cannot communicate with, Powerlink G3 controllers such as the NF500G3, NF1000G3, NF2000G3, or NF3000G3. If one of these controllers is present on the master panel, remove it before installing.

1.3.2. Connection To Master Panel #0 (Master)

Each Square D Smart breaker panel system has at least one panel that is the “master” panel. The master panel has a power supply that provides power to turn the breakers ON and OFF, both for itself and for expansion panels, or “slave” panels. The master panel’s Square D network address is always #0; however, it is referred to in the Gateway’s interface as “Panel #1.”

For E2 MODBUS direct connection, a total of up to eight (8) panels (one “master” panel and seven “slave” panels) can be addressed per E2, with the “master”panel always set up as the first panel.

To network the master panel to the Square D Gateway, use two-connector shielded cable (Belden #8761 or equivalent). Connect the Gateway’s MODBUS connector (located in the top right corner of the board) to the pluggable connector on the bottom side of the master panel’s power supply (see ***Figure 1-3***).

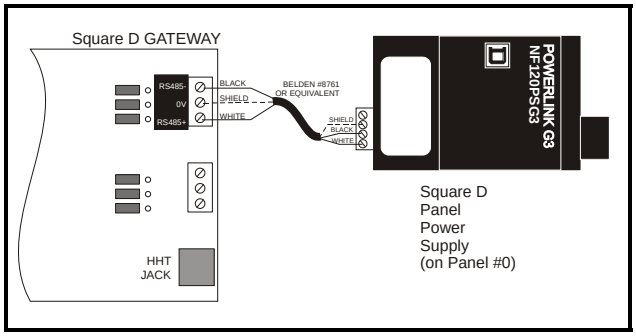


Figure 1-3 *- MODBUS Gateway to Square D Panel Wiring*

For E2 MODBUS direct support the Gateway is not used. Wire the MODBUS network directly to the pluggable connector on the bottom side of the master panel’s power supply (***Figure 1-4***):

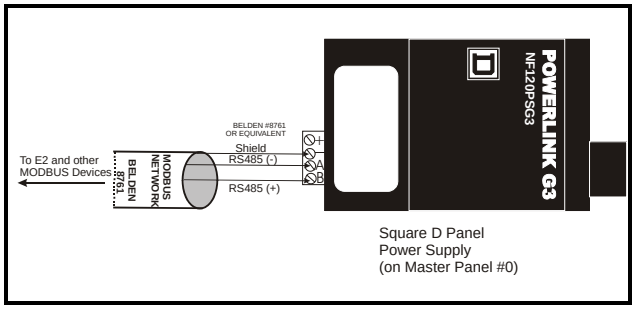


Figure 1-4 *- E2 MODBUS to Square D Panel Wiring*

1.3.3. Networking Square D Master Panel to Square D Expansion Rails

In addition to Panel #0 mentioned in **Section 1.3.2.*, Connection To Master Panel #0 (Master)***, the Square D Gateway can communicate with expansion panels, or "slave panels." Expansion panels must be wired in series with the master panel and the Square D Gateway. The E2 MODBUS direct support can communicate with up to eight (8) Square D breaker panels (one "master" panel and seven "slave" panels).

Locate the address selector on each expansion panel. The address selector has a four-terminal pluggable connector next to the rotary addressing switch (***Figure 1-5***).

Use Belden #27326 (4-conductor, 18 AWG Class 1 cable) or equivalent to wire the expansion panels to the MODBUS network. See ***Figure 1-5***.

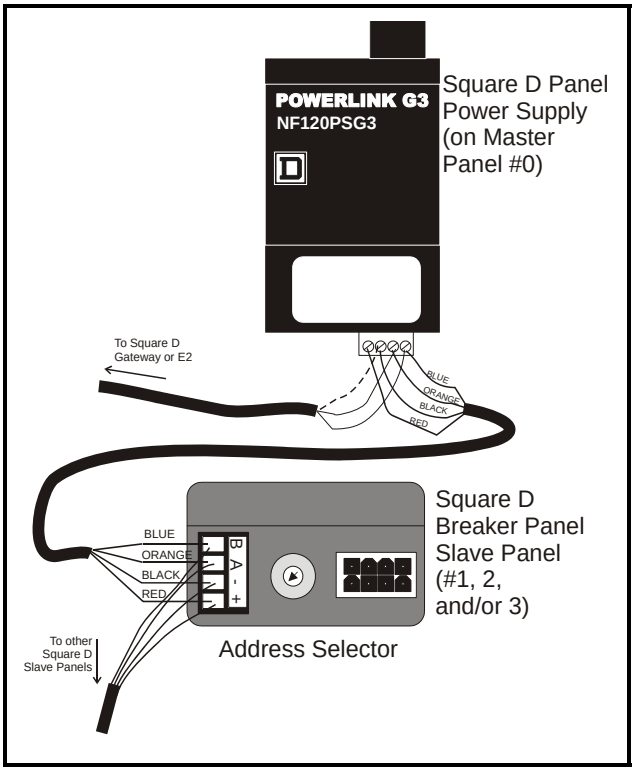


Figure 1-5 *- MODBUS Square D Master Panel to Expansion Panel*

1.3.4. Expansion Panel Cable Maximum Length

The total amount of wire connecting the Powerlink master panel to all slave panels is limited based on the type of power supply being used and the nominal voltage. ***Table 1-2*** lists the power supplies and their corresponding maximum cable lengths.

The maximum cable length does NOT include the cable connecting the master panel to the Gateway board or the E2 MODBUS network.

Power Supply Part #	Nominal Voltage	Max Cable Length
NF120PSG3	120V	400 ft (122 m)
NF240PSG3	220V	100 ft (30 m)
	240V	400 ft (122 m)
NF277PSG3	277V	400 ft (122 m)

Table 1-2 *- Square D Powerlink G3 Power Supplies*

1.3.5. Network Panel Addressing

When more than one Square D Smart breaker panel is networked with the Square D Gateway or E2, each panel must be given a unique network ID on the MODBUS network. The panel with the power supply (the master panel) is always automatically addressed as Panel #0. Expansion panels must be addressed by setting the rotary dial on the address selector. Each expansion panel should be numbered in sequence (#1, #2, and #3).

Powerlink panels have no on-board termination and must be terminated by placing a 150-ohm resistor, or by using the Retail Solutions terminal block (*P/N 535-2711*) between the B and A terminals on the MODBUS connector ***(Figure 1-6)***.

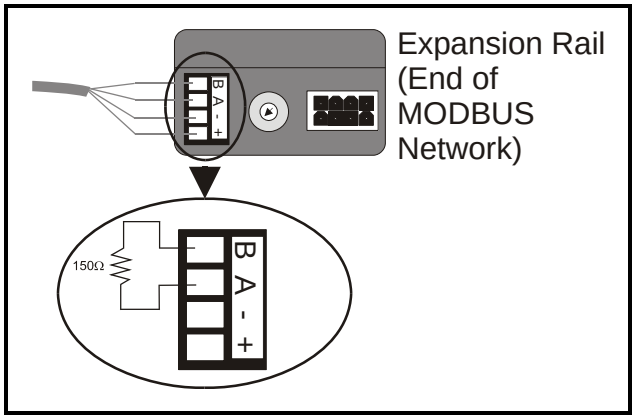


Figure 1-6 *- Powerlink Panel MODBUS Termination (Expansion Rail Connector shown)*

2 E2 MODBUS Direct Support for Square D Breaker Panels

2.1. Network Connection to E2

Connecting a Square D breaker panel to an E2 unit requires the E2 to be version 2.71 or above. Contact Retail Solutions for upgrade information if the controller is a version prior to 2.71.

If you are using a REFLECS, Einstein, or E2 prior to version 2.71, a Gateway board is required to communicate with the Square D Smart breaker panels. Refer to section **Section 3,** ***Square D Smart Breaker Gateway Board*** for more information.

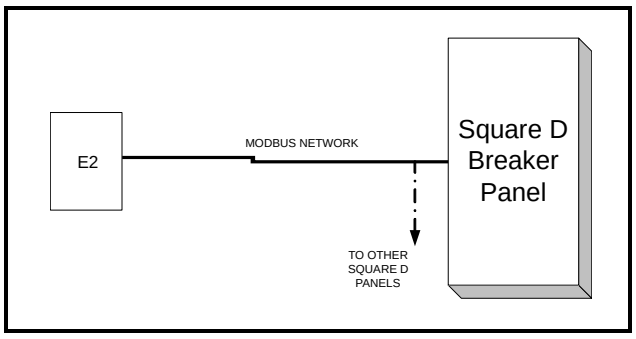


Figure 2-1 *- Square D Panel MODBUS Connection Layout*

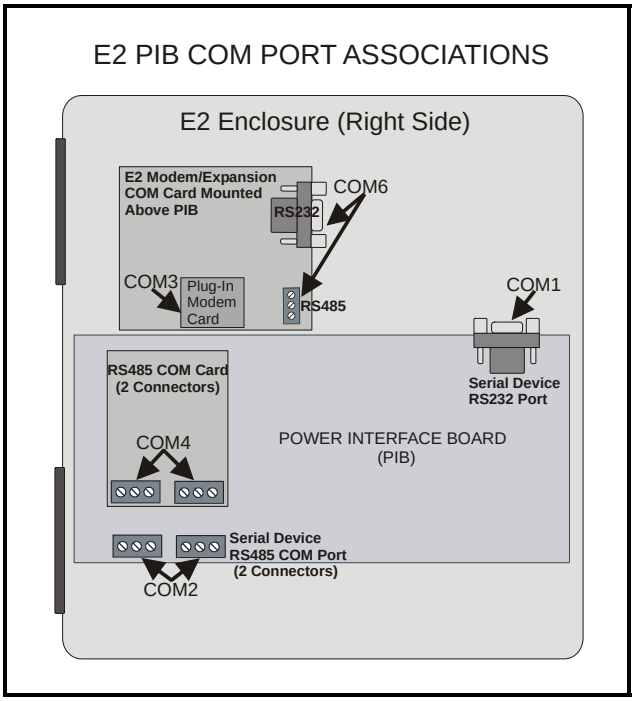


Figure 2-2 *- Location of E2 COM Ports - E2 PIB Board*

An E2 has up to three COM ports that can be assigned for MODBUS communication (COM2, an RS485 port on the E2 power interface board, and COM4 and COM6, which are optional ports requiring expansion cards). COM ports can only be used for one function; in other words, if COM2 is set up as the I/O network, you cannot connect MODBUS devices to COM2. Ensure your E2 is equipped with an RS485 COM Card (*P/N 637-4890*) and configured in E2 General Services (Menu 7 3 1, **Serial** tab) to enable COM4 or an E2 Expansion COM Card (*P/N 637-4871*) to enable COM6.

Connect the MODBUS network cable to the three-terminal connector on the COM port you wish to assign as MODBUS. Wire RS485+ to the Square D power supply B terminal. RS485- to the Square D power supply A terminal, and the shield cable to the Square D power supply minus (-) terminal.

If other MODBUS devices are on the same network segment as the Square D breaker panels, they should be wired prior to the first Square D breaker panel. This is due to the MODBUS network wire type change when going from a Square D “master” breaker panel to a Square D “slave” breaker panel.

CAUTION: When Square D Breaker Panels are on the network, any MODBUS devices on the network cannot have an address of 58. If a MODBUS device has an address of 58, it will cause the Square D Breaker Panels to go offline.

2.1.1. E2 Termination

If the E2 will be the first device in the daisy-chain, set the port's termination jumpers to the TERMINATED & BIASED position (all three jumpers UP); otherwise, set all jumpers DOWN if not the first device.

2.2. E2 Setup of Square D Breaker Panels

2.2.1. Set Up Network Ports

Before setting up a Square D breaker panel, the port on the E2 that has the MODBUS cable connected must be set up as a MODBUS port.

1. Log in to the E2 with Level 4 access.
2. Press Menu followed by & 7 # 3 ! 1 - **General Controller Info**.
3. Press Ctrl + # 3 to open the **Serial** tab of the General Controller Info setup screens:

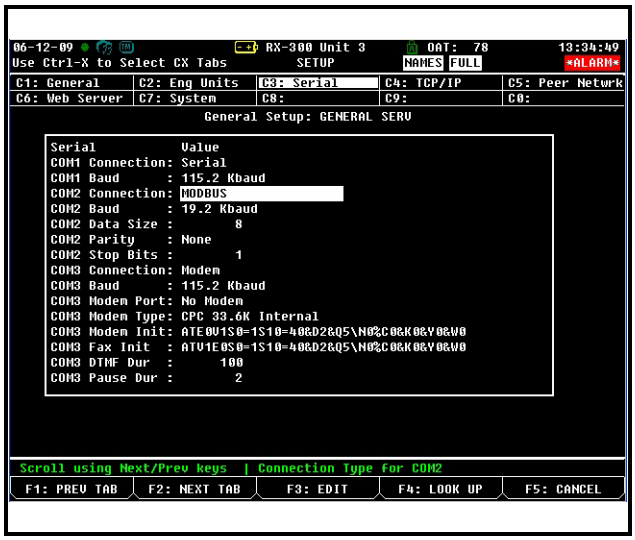

06-12-09 RX-300 Unit 3 OAT: 78 13:34:49
Use Ctrl-X to Select CX Tabs SETUP NAMES FULL ALARM
C1: General C2: Eng Units C3: Serial C4: TCP/IP C5: Peer Netwrk
C6: Web Server C7: System C8: C9: C0:
General Setup: GENERAL SERV
Serial Value
COM1 Connection: Serial
COM1 Baud : 115.2 Kbaud
COM2 Connection: MODBUS
COM2 Baud : 19.2 Kbaud
COM2 Data Size : 8
COM2 Parity : None
COM2 Stop Bits : 1
COM3 Connection: Modem
COM3 Baud : 115.2 Kbaud
COM3 Modem Port: No Modem
COM3 Modem Type: CPC 33.6K Internal
COM3 Modem Init: ATE0V1S0=1S10=40&D2&Q5\N0%C0&K0&Y0&W0
COM3 Fax Init : ATV1E0S0=1S10=40&D2&Q5\N0%C0&K0&Y0&W0
COM3 DTMF Dur : 100
COM3 Pause Dur : 2
Scroll using Next/Prev keys | Connection Type for COM2
F1: PREV TAB F2: NEXT TAB F3: EDIT F4: LOOK UP F5: CANCEL

Figure 2-3 *- Serial Communications Manager Screen*

4. This screen will have a "Connection" field for all COM ports on the E2. Highlight the COM port connection field that will be used, and press F4 - **LOOK UP**. From the list of network types, select **MODBUS**.
5. Four fields will become visible underneath the COM port connection field, which pertain to the way the device communicates:

   •**Baud -** Default setting is **19.2k**. Leave this field at the default value.

   •**Data Size -** Leave this field at the default value (**8**).

   •**Parity -** Leave this field at the default value (**None**).

   •**Stop Bits -** Leave this field at the default value (**1**).
6. Press Enter to save changes and exit.

2.2.2. Add and Connect Square D Breaker Panels

To enable communications between E2 and the Square D breaker panels, the devices must be added and addressed in E2.

1. Log in to the E2 with Level 4 access.
2. Press Menu & 7 & 7 @ 2 - **Connected I/O Boards and Controllers**.

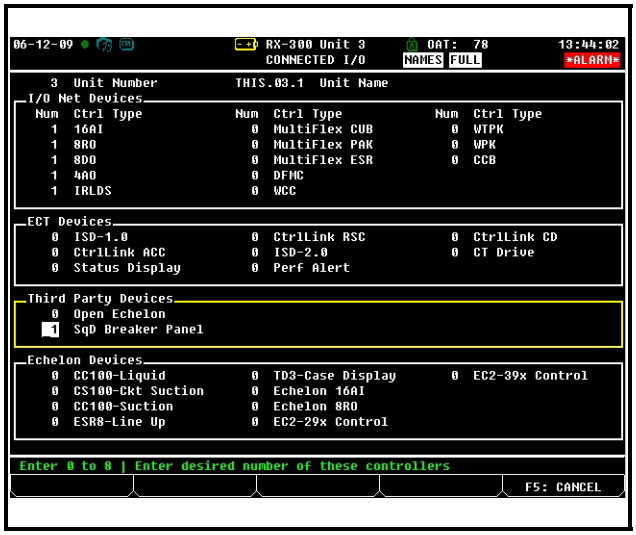

06-12-09 RX-300 Unit 3 OAT: 78 13:44:02
CONNECTED I/O NAMES FULL ALARM
3 Unit Number THIS.03.1 Unit Name
I/O Net Devices
Num Ctrl Type Num Ctrl Type Num Ctrl Type
1 16AI 0 MultiFlex CUB 0 WTPK
1 8RO 0 MultiFlex PAK 0 WPK
1 8DO 0 MultiFlex ESR 0 CCB
1 4AO 0 DFMC
1 IRLDS 0 WCC
ECT Devices
0 ISD-1.0 0 CtrlLink RSC 0 CtrlLink CD
0 CtrlLink ACC 0 ISD-2.0 0 CT Drive
0 Status Display 0 Perf Alert
Third Party Devices
0 Open Echelon
1 SqD Breaker Panel
Echelon Devices
0 CC100-Liquid 0 TD3-Case Display 0 EC2-39x Control
0 CS100-Ckt Suction 0 Echelon 16AI
0 CC100-Suction 0 Echelon 8RO
0 ESR8-Line Up 0 EC2-29x Control
Enter 0 to 8 | Enter desired number of these controllers
F5: CANCEL

Figure 2-4 *- Connected I/O Screen*

3. On the Connected I/O screen, in a box labeled **Third Party Devices**, enter the number of Square D Panels in the **SqD Breaker Panel** number field.
4. Press Enter to return to the Network Setup

menu, then select # 3 - **Controller Setup** (***Figure 2-5***).

5. Locate the Square D breaker panels you added to the network list (press Page Up and Page Down to scroll through the list). The default name for a Square D breaker panel begins with a two-letter designator of the model type (**SD** for Square D). If desired, enter a new name for each device in the **Name** field.

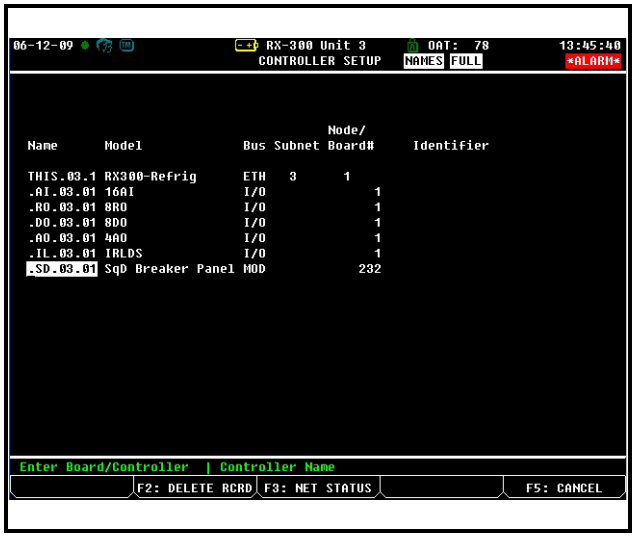


Figure 2-5 *- Controller Setup Screen*

Each Square D breaker panel is assigned a MODBUS address automatically when it is created. Each MODBUS panel has two addresses (one for the L rail and one for the R rail). The addresses start at 232 (displayed under the **Node/Board#** column in ***Figure 2-5***) for the first panel ("master" panel) and 234 for the second panel ("slave" panel #1), 236 for the third panel ("slave" panel #2), up to a total of eight panels. One "master" and seven "slave" panels.

6. When finished, press ESC to return to the Network Setup menu, then press ! 1 - **Online Status** (***Figure 2-6***). Locate the Square D breaker panels you set up, and look at each device's status in the **Status** field. You will see one of the following messages:
   - ***Online*** - The Square D breaker panel is communicating normally.
   - ***Offline*** - The Square D breaker panel is not communicating, has not been commissioned, is not functional, or is not powered up. Verify the Square D breaker panel is powered up, wired correctly, and has the proper network address, baud rate, and parity (see **Section 4, *Troubleshooting***).
   - ***No Port*** - No port is set up in the E2 Serial Configuration Manager to be a MODBUS port. Follow the instructions in **Section 2.2.1., *Set Up Network Ports***.

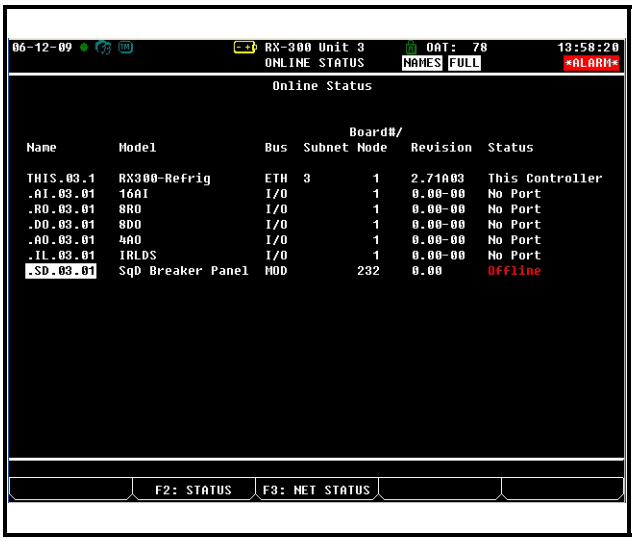

06-12-09
RX-300 Unit 3
ONLINE STATUS
OAT: 78
NAMES FULL
13:58:20
ALARM
Online Status
Board#/
Name Model Bus Subnet Node Revision Status
THIS.03.1 RX300-Refrig ETH 3 1 2.71A03 This Controller
.AI.03.01 16AI I/O 1 0.00-00 No Port
.RO.03.01 8RO I/O 1 0.00-00 No Port
.DO.03.01 8DO I/O 1 0.00-00 No Port
.AO.03.01 4AO I/O 1 0.00-00 No Port
.IL.03.01 IRLDS I/O 1 0.00-00 No Port
.SD.03.01 SqD Breaker Panel MOD 232 0.00 Offline
F2: STATUS
F3: NET STATUS

Figure 2-6 *- Online Status Screen*

2.3. Square D Application Setup in E2: Single Breaker

2.3.1. Adding Lighting Schedule Application

For each group of breakers to be controlled separately, set up a Lighting Schedule application from the Add New Application screen.

Press the Menu key to access the Main Menu, then:

1. ^ 6 Add/Delete Application
2. ! 1 Add New Application

Press F4 - **LOOK UP** to select **Lighting Schedule**. Enter the number of desired applications in the **How Many?** field.

2.3.2. Light Outputs and Proof Inputs Setup

Once the Lighting Schedule applications have been added, set up the light output and proof input for each Lighting application. (Proof input setup may be optional.) The outputs of a Lighting Schedule cell

control the breakers on the Square D breaker panels, and the proof inputs of the Lighting Schedule cell are the Square D panel breaker status outputs.

2.3.2.1. Light Outputs Setup

1. Under the **Outputs** tab, change the **LIGHTS OUTPUT** format by pressing F3 **- EDIT** and then **1. Alternate I/O Formats** to *Controller*:*Application*:*Property* from the *Board*:*Point* format.
2. For the *Controller* property, use F4 **- LOOK UP** to select the Square D breaker panel, for the *Application* property select lighting panel, and for the *Output* property select the breaker input number (**BREAKER_IN_X**).

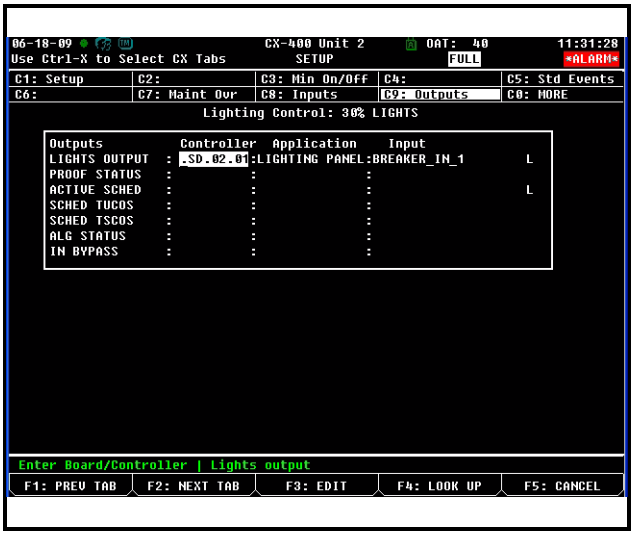

06-18-09 CX-400 Unit 2 OAT: 40 11:31:28
Use Ctrl-X to Select CX Tabs SETUP FULL *ALARM*
C1: Setup C2: C3: Min On/Off C4: C5: Std Events
C6: C7: Maint Ovr C8: Inputs C9: Outputs C0: MORE
Lighting Control: 30% LIGHTS
Outputs Controller Application Input
LIGHTS OUTPUT : .SD.02.01:LIGHTING PANEL:BREAKER_IN_1 L
PROOF STATUS :
ACTIVE SCHED : L
SCHED TUCOS :
SCHED TSCOS :
ALG STATUS :
IN BYPASS :
Enter Board/Controller | Lights output
F1: PREV TAB F2: NEXT TAB F3: EDIT F4: LOOK UP F5: CANCEL

Figure 2-7 *- Single Breaker Lighting Output Setup in E2 Lighting*

2.3.2.2. Proof Inputs Setup

To enable proofing, set **Enable Proofing** to **Yes** for each Lighting application under the **Setup** tab.

Press F2 or F3 to access the Lighting Schedule from the Home screen depending on whether a BX or CX E2 controller is being used.

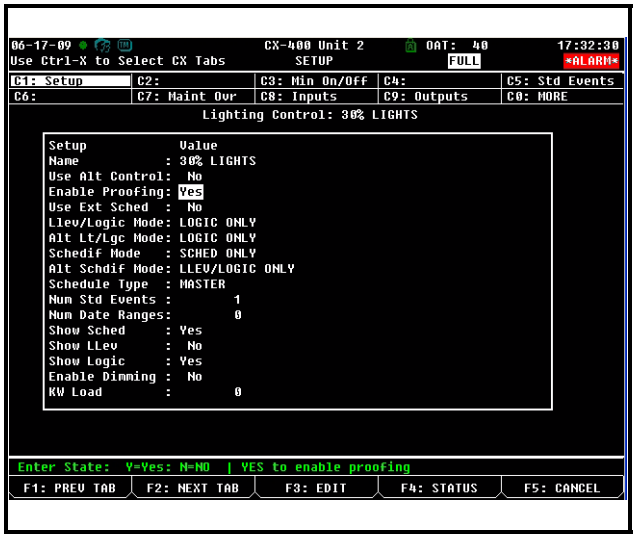

06-17-09 CX-400 Unit 2 OAT: 40 17:32:30
Use Ctrl-X to Select CX Tabs SETUP FULL *ALARM*
C1: Setup C2: C3: Min On/Off C4: C5: Std Events
C6: C7: Maint Ovr C8: Inputs C9: Outputs C0: MORE
Lighting Control: 30% LIGHTS
Setup Value
Name : 30% LIGHTS
Use Alt Control: No
Enable Proofing: Yes
Use Ext Sched : No
Llev/Logic Mode: LOGIC ONLY
Alt Lt/Lgc Mode: LOGIC ONLY
Schedif Mode : SCHED ONLY
Alt Schdif Mode: LLEV/LOGIC ONLY
Schedule Type : MASTER
Num Std Events : 1
Num Date Ranges: 0
Show Sched : Yes
Show LLev : No
Show Logic : Yes
Enable Dimming : No
KW Load : 0
Enter State: Y=Yes: N=NO | YES to enable proofing
F1: PREV TAB F2: NEXT TAB F3: EDIT F4: STATUS F5: CANCEL

Figure 2-8 *- Enable Proofing on Setup Tab*

If using a single Square D breaker, associate the proof input (**PROOF IN**) with the Square D panel (***Figure 2-9***) and status of the breaker number from the **More** tab in the Lighting application:

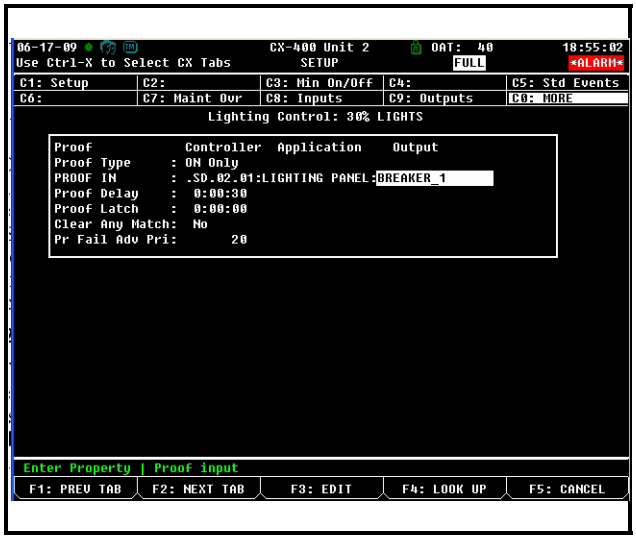

06-17-09 CX-400 Unit 2 OAT: 40 18:55:02
Use Ctrl-X to Select CX Tabs SETUP FULL *ALARM*
C1: Setup C2: C3: Min On/Off C4: C5: Std Events
C6: C7: Maint Ovr C8: Inputs C9: Outputs C0: MORE
Lighting Control: 30% LIGHTS
Proof Controller Application Output
Proof Type : ON Only
PROOF IN : .SD.02.01:LIGHTING PANEL:BREAKER_1
Proof Delay : 0:00:30
Proof Latch : 0:00:00
Clear Any Match: No
Pr Fail Adv Pri: 20
Enter Property | Proof input
F1: PREV TAB F2: NEXT TAB F3: EDIT F4: LOOK UP F5: CANCEL

Figure 2-9 *- Single Breaker Proof Input Setup in E2 Lighting*

1. Change the **PROOF IN** format by pressing F3 **- EDIT** and then **1. Alternate I/O Formats** to *Controller*:*Application*:*Property* from the *Board*:*Point* format.
2. For the *Controller* property, use F4 **- LOOK UP** to select the Square D breaker panel, for the *Application* property select lighting panel, and for the *Output* property select the breaker number (**BREAKER_X**).

2.4. Square D Application Setup in E2: Multiple Breaker Grouping

NOTE: A Group can contain one or more breakers as defined by a user. Assigning multiple breakers to a group allows an entire group of breakers to be turned on or off simultaneously, instead of each individual breaker being turned on or off separately.

2.4.1. Setting Light Outputs

1. To group multiple breakers to a single Lighting application, press F3 - **EDIT** and select **2. Set Multiple Outputs**.

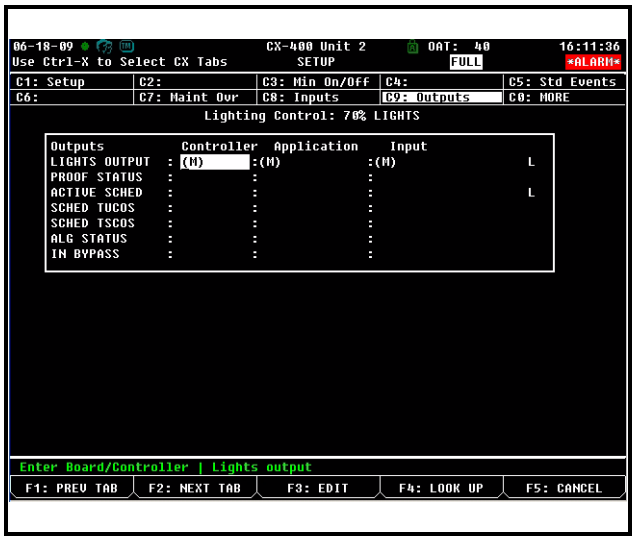


Figure 2-10 *- Set Multiple Breakers in E2 Lighting*

The Multiple Output Setup screen opens (***Figure 2-11***) where you can set up the *Controller*, *Application*, and *Property* Lighting outputs.

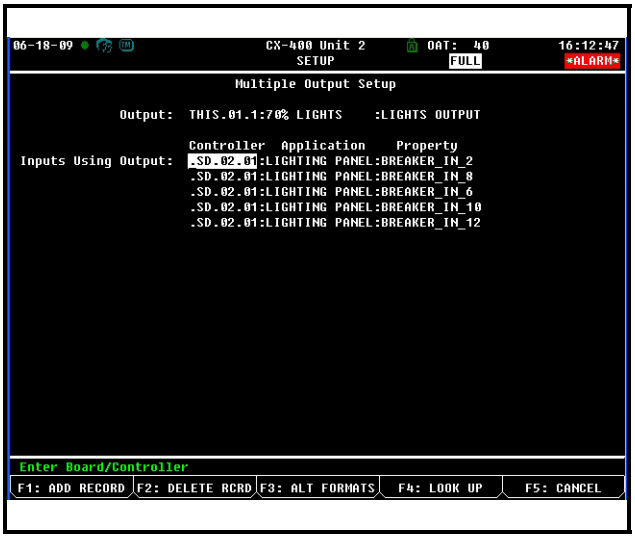


Figure 2-11 *- Multiple Output Setup View*

2. For the *Controller* property, press F4 - **LOOK UP** to select the Square D breaker panel, for the *Application* property select lighting panel, and for the *Property* output select the breaker input number (**BREAKER_IN_X**). Repeat for each breaker you wish to group to this Lighting application.

2.4.2. Proof Inputs Setup for Multiple Breaker Grouping

1. To enable proofing, set **Enable Proofing** to **Yes** for each Lighting application under the **Setup** tab. Press F2 or F3 to access the Lighting Schedule from the Home screen depending on whether a BX or CX E2 controller is being used.

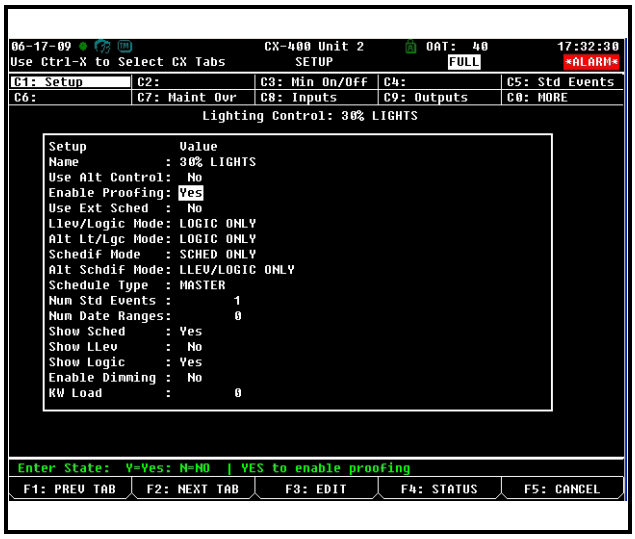

06-17-09 CX-400 Unit 2 OAT: 40 17:32:30
Use Ctrl-X to Select CX Tabs SETUP FULL *ALARM*
C1: Setup C2: C3: Min On/Off C4: C5: Std Events
C6: C7: Maint Ovr C8: Inputs C9: Outputs C0: MORE
Lighting Control: 30% LIGHTS
Setup Value
Name : 30% LIGHTS
Use Alt Control: No
Enable Proofing: Yes
Use Ext Sched : No
Llev/Logic Mode: LOGIC ONLY
Alt Lt/Lgc Mode: LOGIC ONLY
Schedif Mode : SCHED ONLY
Alt Schdif Mode: LLEV/LOGIC ONLY
Schedule Type : MASTER
Num Std Events : 1
Num Date Ranges: 0
Show Sched : Yes
Show LLev : No
Show Logic : Yes
Enable Dimming : No
KW Load : 0
Enter State: Y=Yes: N=NO | YES to enable proofing
F1: PREV TAB F2: NEXT TAB F3: EDIT F4: STATUS F5: CANCEL

Figure 2-12 *- Enable Proofing on Setup Tab*

When grouping multiple breakers to a Lighting application, add a Digital Combiner application for proofing inputs:

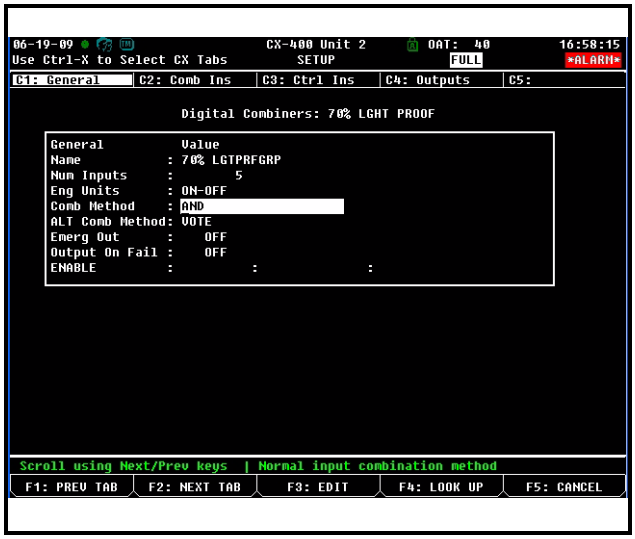

06-19-09 CX-400 Unit 2 OAT: 40 16:58:15
Use Ctrl-X to Select CX Tabs SETUP FULL *ALARM*
C1: General C2: Comb Ins C3: Ctrl Ins C4: Outputs C5:
Digital Combiners: 70% LGHT PROOF
General Value
Name : 70% LGTPRFGRP
Num Inputs : 5
Eng Units : ON-OFF
Comb Method : AND
ALT Comb Method: VOTE
Emerg Out : OFF
Output On Fail : OFF
ENABLE : :
Scroll using Next/Prev keys | Normal input combination method
F1: PREV TAB F2: NEXT TAB F3: EDIT F4: LOOK UP F5: CANCEL

Figure 2-13 *- Digital Combiner For Input Proof Grouping*

2. For grouping, set the combination method to **AND** under the **Comb Method** parameter in the General Setup and add a name that will associate the proof input group to the Lighting application.
3. Set the number of inputs to the number of breakers in the group.
4. Under the **Comb Ins** tab, change the **DIG INPUT1** format by pressing F3 - **EDIT** and then **1. Alternate I/O Formats** to *Controller*:*Application*:*Property* from the *Board*:*Point* format.
5. For the *Controller* property, press F4 - **LOOK UP** to select the Square D breaker panel, for the *Application* property select Lighting Panel, and for the *Inputs* property select the breaker numbers that are included in the group.

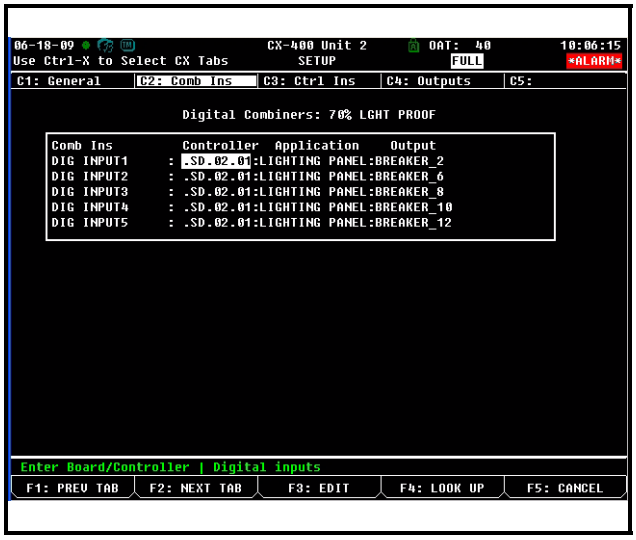

06-18-09 CX-400 Unit 2 OAT: 40 10:06:15
Use Ctrl-X to Select CX Tabs SETUP FULL *ALARM*
C1: General C2: Comb Ins C3: Ctrl Ins C4: Outputs C5:
Digital Combiners: 70% LGHT PROOF
Comb Ins Controller Application Output
DIG INPUT1 : .SD.02.01:LIGHTING PANEL:BREAKER_2
DIG INPUT2 : .SD.02.01:LIGHTING PANEL:BREAKER_6
DIG INPUT3 : .SD.02.01:LIGHTING PANEL:BREAKER_8
DIG INPUT4 : .SD.02.01:LIGHTING PANEL:BREAKER_10
DIG INPUT5 : .SD.02.01:LIGHTING PANEL:BREAKER_12
Enter Board/Controller | Digital inputs
F1: PREV TAB F2: NEXT TAB F3: EDIT F4: LOOK UP F5: CANCEL

Figure 2-14 *- Grouping Inputs in Digital Combiner*

6. Go back to the Lighting application under the **More** tab and associate the Lighting group (***Figure 2-15***) with the Digital Combiner application:

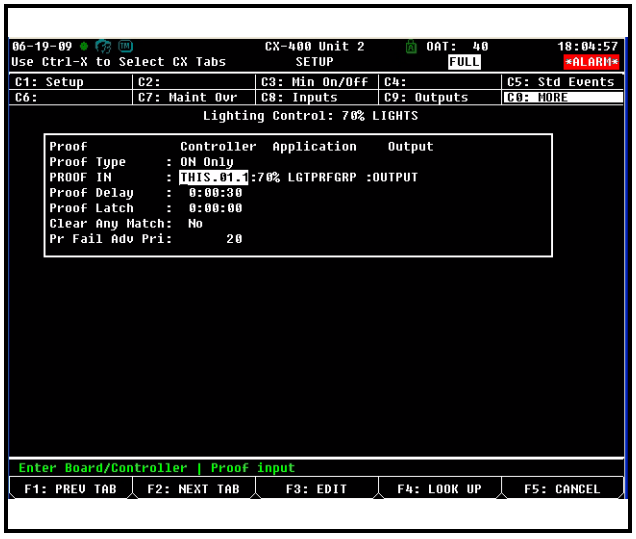


Figure 2-15 *- The Digital Combiner Used To Group Inputs*

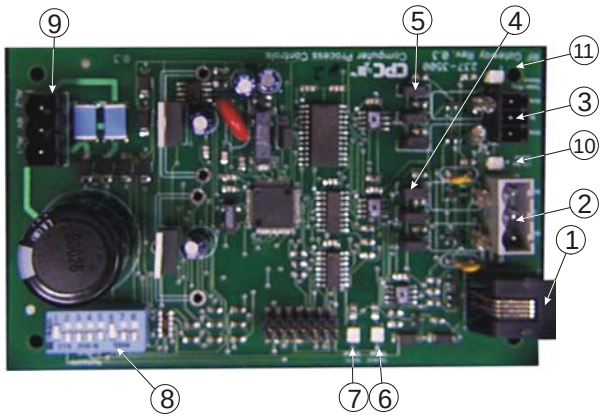
When using the Digital Combiner method above, the **Proof Type** must be set to **ON Only**.

7. Under the **More** tab, change the **PROOF IN** format by pressing F3 - **EDIT** and then **1. Alternate I/O Formats** to *Controller*:*Application*:*Property* from the *Board*:*Point* format.

8. For the *Controller* property, press F4 - **LOOK UP** to select the E2 Name, for the *Application* property select the Digital Combiner that you created, and for the *Output* property select **OUTPUT**.

3 Square D Smart Breaker Gateway Board

3.1. Overview



LEGEND			
1	Hand-Held Terminal Jack	7	Alarm Status LED
2	RS485 I/O Network	8	Dip Switch
3	RS485 Receiver Bus Net	9	Power Connector
4	I/O Net Term Jumpers	10	I/O Net Status LED
5	Receiver Bus Term Jumpers	11	Receiver Bus Status LED
6	General Status LED		

Figure 3-1 *- Square D Gateway Layout*

The Retail Solutions **Square D Smart Breaker Gateway Board** serves as an interface between the Retail Solutions refrigeration and building controllers (REFLECS, Einstein, and E2) and the Square D Powerlink breaker panels. The Gateway Board connects to the Retail Solutions controller via the RS485 I/O network (COM A & D on the REFLECS) and behaves identically to one 16AI input boards and two 8RO output boards, meaning any of the controller's lighting schedule applications may be used to control breakers on the Square D Powerlink panels by addressing them as output points.

The Gateway Board connects to up to four Square D Powerlink panels via a MODBUS network connection. Within the Gateway Board's software, breakers on the Powerlink panels can be grouped together so that one virtual output point can be used to control multiple breakers. Up to 16 groups of breakers can be created for up to four panels of 42 breakers each.

Proof states for each breaker on the network are passed to the Gateway Board, which are then combined based on the breaker groupings into a single digital proof value for the entire group. This combined proof state is fed back to the Retail Solutions site controller via the board's "virtual 16AI points" for purposes of displaying and alarming.

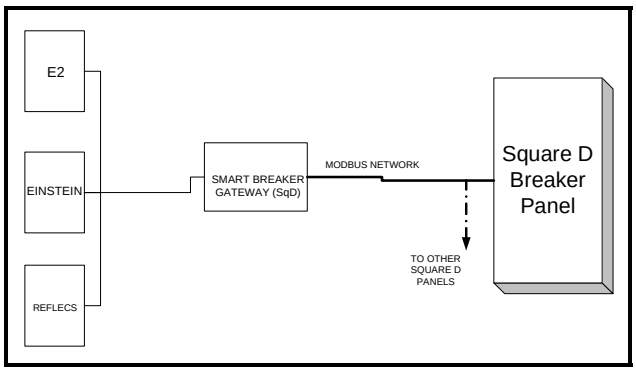


Figure 3-2 *- Square D Panel Layout*

3.2. Mounting

The Square D Gateway is typically mounted in the same area as the Square D Breaker panels. The Gateway is designed to fit into a standard 3" snap track (supplied with the board) or may be mounted in a panel or on stand-offs. Follow the dimensions in ***Figure 3-3*** for panel mounting.

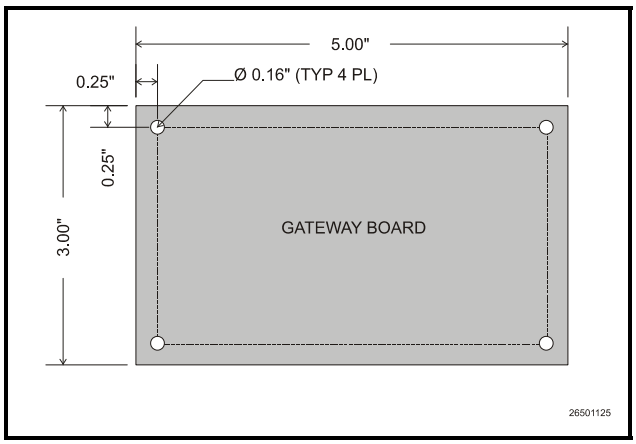


Figure 3-3 *- Gateway Board Mounting Dimensions*

3.2.1. Environmental Specifications

The Square D Gateway should be mounted in an environment with ambient temperature between -40°F and 150°F, with a non-condensing relative humidity between 5% and 95%.

3.2.2. Square D Breaker Panel Mounting

Refer to the documentation and diagrams supplied with your Square D breaker panel(s).

3.3. Power Wiring

3.3.1. Square D Smart Breaker Gateway

Input Voltage	24VAC, Class 2, center-tapped, 50/60Hz
Power	5VA

Table 3-1 *- Gateway Power Requirements*

The Square D Gateway requires 24VAC power from a Class 2 *center-tapped* transformer.

Retail Solutions supplies several sizes of center-tapped transformers for powering multiple 16AIs, 8ROs, and other RS485 peripheral boards of the Einstein and REFLECS systems.

Refer to your controller's user manual for information on how to use the center-tapped transformers listed in ***Table 3-2*** to power multiple RS485 I/O devices.

Figure 3-4 and ***Figure 3-5*** show how to connect the 56VA and 80VA transformers to the Square D Gateway power connector.

	Three-Board	Six-Board
P/N	640-0056	640-0080
Power Rating	56 VA	80 VA

Table 3-2*-Power Ratings for Retail Solutions Transformers*

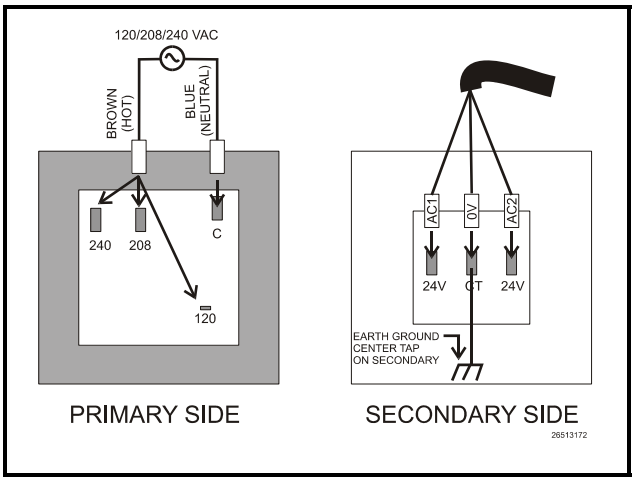


Figure 3-4 *- Pinout for the 56VA (640-0056) and 80VA (640-0080) Transformers*

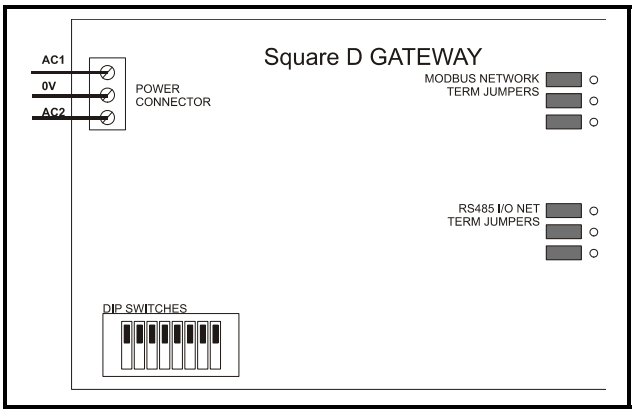


Figure 3-5 *- Power Wiring on Square D Gateway*

3.4. Networking

3.4.1. Wiring the Square D Gateway to a Retail Solutions Site Controller (I/O Network)

Each Einstein or REFLECS site controller that will command a Square D Smart breaker panel must have a Square D Gateway installed on its RS485 I/O Network. For Einstein and E2 controllers, this means the Gateway will be installed on the I/O Network; for RMCC, BEC, BCU, and other REFLECS products, the Gateway will be installed on the COM A or COM D network.

3.4.1.1. Wire Connection

Using shielded two-conductor network cable (Belden #8761 or equivalent), connect the RS485 I/O Network wire to the three-terminal connector on the Gateway board as shown in ***Figure 3-6***. For further information about how RS485 networks are configured, refer to your site controller's user manual.

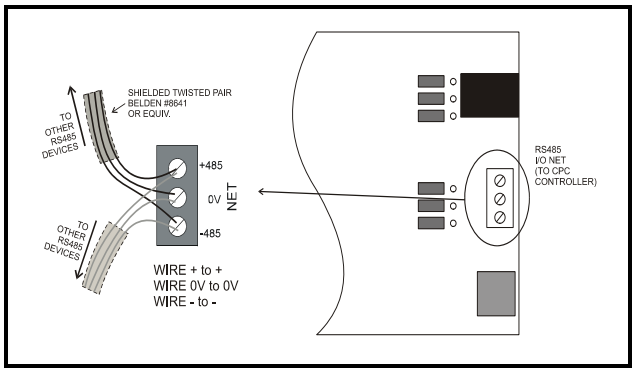


Figure 3-6 *- Connecting the Square D Gateway to the RS485 Network*

3.4.1.2. Gateway Board I/O Network Addressing

> ***NOTE: The network dip switch on the Square D Gateway board does <u>not</u> set the board number. Board numbering must be done with a Hand-Held Terminal.***

A Square D Gateway board behaves on the network as if it were one (1) 16AI board and two (2) 8RO boards. Though the Gateway board has a set of dip switches on it labeled "Network Switch," this switch is not used to set the board numbering. Board numbering must be done in the Gateway's software using a Hand-Held Terminal.

With the Gateway board powered up, plug a HHT in the board's HHT jack. When the screen titled "CPC SQUARED-GW" appears, press the down arrow key once to access the HHT screen used to set up network addressing.

```
16AI ADDR:      1
8RO ADDR:       1
```

Press the RIGHT arrow key to make the cursor appear, and enter the address of the virtual 16AI board this Gateway will represent.

Press the down arrow key to move the cursor to the 8RO ADDR field. The number you enter in this field will determine the address of the two virtual 8RO boards. One board will use the address you enter, and the second will be the next address number in the sequence. For example, setting this field to 4 will cause the two virtual 8RO boards to be numbered 4 and 5.

3.4.1.3. Setting the Baud Rate Dip Switches

Dip switches 6 and 7 control the baud rate at which the Square D Gateway communicates with the site controller on the RS485 Network. These switches must be set to the same baud rate setting as the Einstein or REFLECS (usually 9600 baud).

The MODBUS baud rate used by the Gateway board to communicate with the Square D panels is fixed at 19200 baud, since this is the only baud rate used by this device.

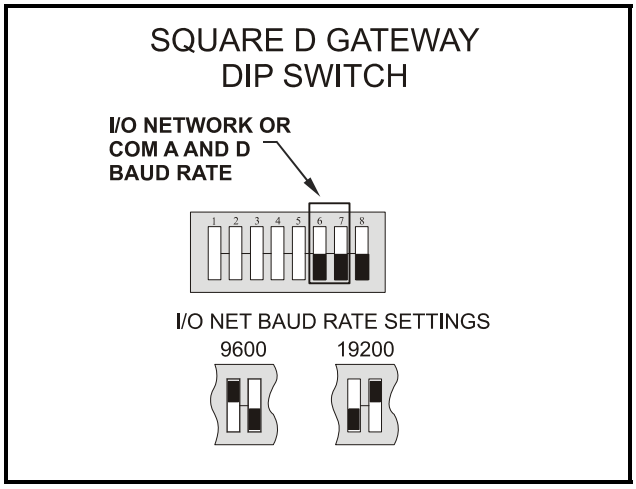


Figure 3-7 *- Dip Switch Setting for Square D Gateway Baud Rate*

3.4.1.4. Setting the RS485 I/O Termination Jumpers

As part of a site controller's RS485 I/O (COM A or COM D) Network, a Gateway must be terminated if it is the end device of a daisy chain. Refer to the site controller's user manual for information about daisy chain networks and how they are terminated.

To terminate the Gateway, set the I/O Network Jumpers to the RIGHT position as shown in ***Figure 3-8***. To unterminate the Gateway, set the jumpers to the LEFT position.

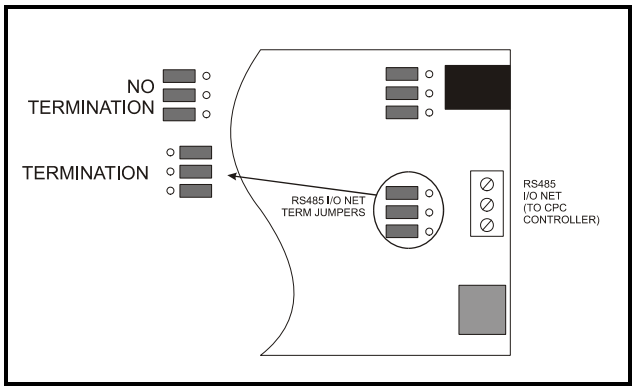


Figure 3-8 *- Square D Gateway RS485 I/O Network Termination*

3.4.2. Gateway with Square D Panel

Connection between the Gateway and the Square D Panel(s) is achieved through the MODBUS network connector at the top right of the Gateway board and the network connectors on the Square D panels.

3.4.2.1. MODBUS Network Termination

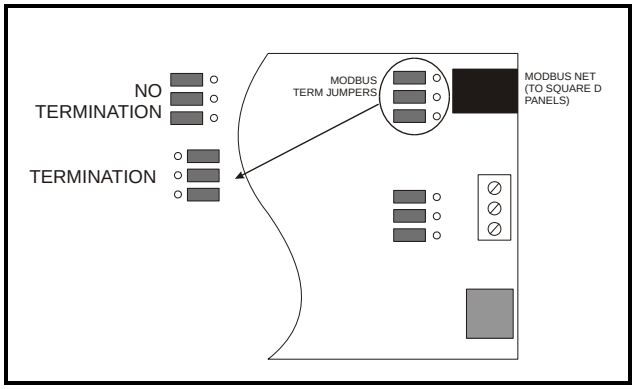


Figure 3-9 *- Square D Gateway MODBUS Network Termination*

Like the RS485 I/O network, the two end devices on the MODBUS network must be terminated. Typically, one of the end devices will be the Gateway board and the other a master or slave panel.

Figure 3-9 shows the location of the MODBUS termination jumpers on the Gateway board. Non-Gateway E2 Software Setup (Direct Connection to E2).

3.5. Site Controller Software Setup - Gateway Board

3.5.1. REFLECS

Each group set up in the Gateway has its own virtual 8RO and 16AI point command of the relay and proof feedback (respectively). Refer to your REFLECS controller's manual for set up instructions.

3.5.2. E2 and Einstein

3.5.2.1. Board and Application Setup

Set up the number of boards (one 16AI and two 8ROs) on the I/O Network from the Connected I/O screen. Press the Menu key to open the Main Menu and press:

1. & 7 System Configuration
2. & 7 Network Setup
3. @ 2 Connected I/O Boards and Controllers

If using an Einstein controller, from the Main Status/Home screen, press F8 (Actions), 4 Network Status/Setup, and then 2 Connected I/O Boards & Controllers.

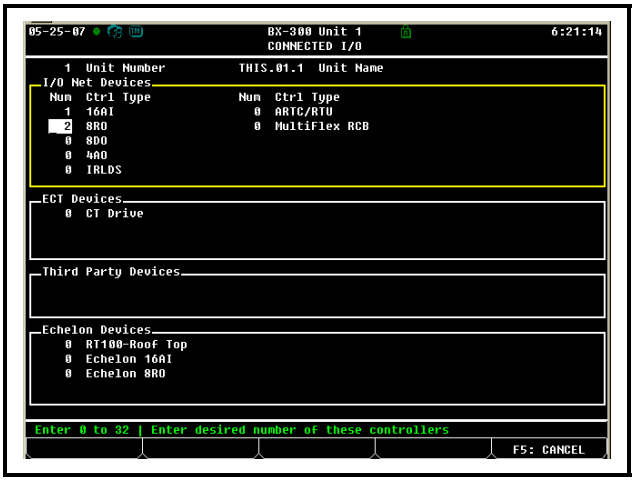


Figure 3-10 *- Connected I/O Boards Screen*

Add one 16AI and two 8RO boards on this screen, and press ↵ to save and exit.

3.5.2.2. Adding Lighting Schedule Applications

For each group of breakers to be controlled separately, set up a Lighting Schedule application from the Add New Application screen.

Press the Menu key to access the Main Menu, then:

1. ^ 6 Add/Delete Application
2. ! 1 Add New Application
3. F4 - LOOK UP to select **Lighting Schedule**. Enter the number of desired applications in the **How Many?** field.

If using an Einstein controller, from the Home screen or Enhanced Lighting Status screen, press F8 (Actions), * B (Setup), and choose the **S1:Setup** tab. (Note that the Proof tab is **S8** and the Outputs tab is **S9**).

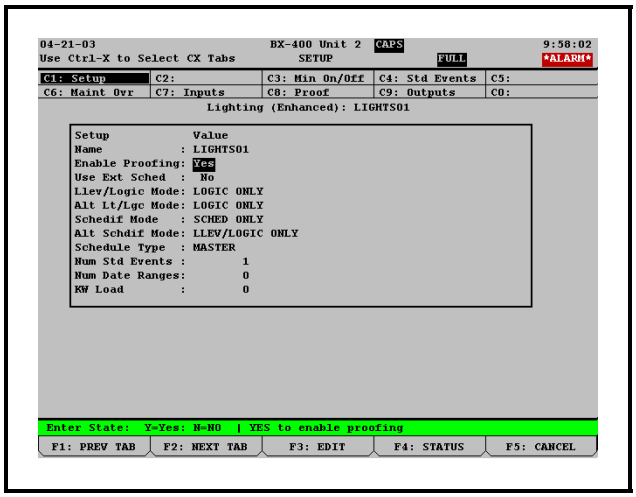


***Figure 3-11** - Setup Lighting Control*

If using an Einstein controller, from the Home screen or Enhanced Lighting Status screen, press F8 (Actions), * Z (Control Appl Setup), and then 1 (Add Control Application). Press F7 (Look Up) to select **Enhanced Lighting**. Press F9 (Home) to return to the Home screen.

> ***TRY THIS: When creating a name for your Lighting application, incorporate the application's corresponding group number into the name. For example, PARKLIGHTS01 associates the parking lot breakers with Group 1.***

3.5.2.3. Proof Inputs and Light Outputs Setup

Once the Lighting Schedule applications have been added, set up the proof inputs and light outputs for each Lighting application. The outputs of a Lighting Schedule cell control the breakers on the Square D panels, and the inputs are the combined proofs of all the breakers that are part of the group being controlled by the application.

Proof Inputs Setup

Set up 16AI board inputs in Proof Setup. To enable proofing, set **Enable Proofing** to **Yes** for each Lighting application by accessing the Lighting Control Setup screen. From the Main Menu:

1. Press F3 (Lighting Sched) and select the a Lighting application.
2. F5 (Setup) to go the Setup screen for that Lighting application.

3. Under the **C1:Setup** tab, set **Enable Proofing** to **Yes**. (**C8:Proof** tab becomes visible once you cursor across the tabs. See *Figure 3-12*.)
4. Press F2 (Next Tab) or F1 (Prev Tab) to cursor over to **C8:Proof** tab.

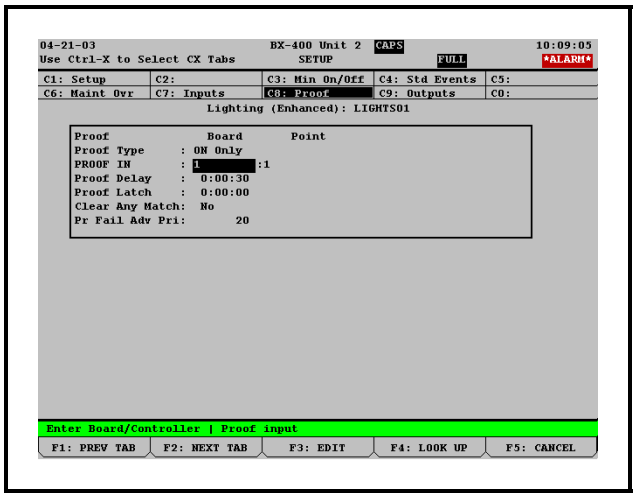


***Figure 3-12** - Lighting Proof Setup Screen*

5. Set **Proof Type** to **ON Only**. If the light circuit is read as open when it should normally be closed, the 16AI board will send a "fail" input relay to the controller. The Gateway proofs both ON and OFF so that the user can

select the desired proof type as **ALL Values**, **ON Only**, or **OFF Only**. If any breaker within a group fails the proof, the entire group will fail the proof.

6. In the **PROOF IN** input, enter the virtual board and point address of the proof input on the gateway for the lighting group.
7. Set **Proof Delay** to a minimum of two minutes. (0:02:00)
8. Press F2 (Next Tab) or F1 (Prev Tab) to cursor over to **C9: Outputs** tab.

NOTE: If a breaker is assigned to a group that is not set up, a proof failure message will occur.

Light Outputs Setup

The Lighting Outputs Setup screen is where you will set up the 8RO board and point numbers for each group for all Lighting applications.

Refer to ***Table 5-3*** to associate the inputs and outputs with their corresponding group, board and point numbers.

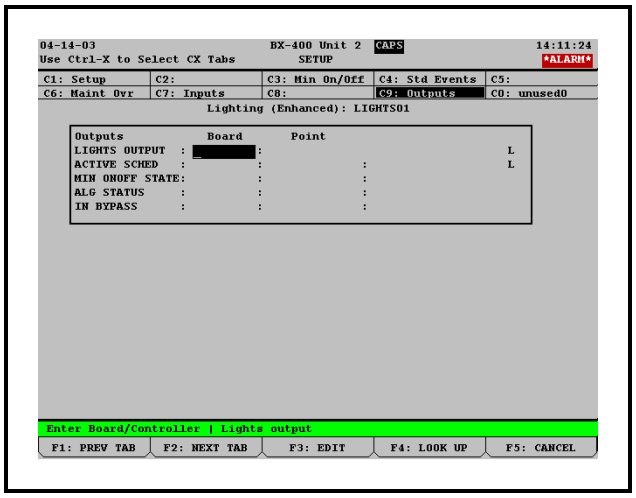


Figure 3-13 *- Lighting Outputs Setup Screen*

For more information on setting up Lighting Schedules, refer to section **9.7 Lighting Schedules** in the ***E2 RX Refrigeration and BX HVAC I&O Manual***.

3.6. Software Setup

3.6.1. Smart Breaker Gateway (HHT)

Connect the HHT to the Gateway board via the HHT jack (refer to ***Figure 3-1***). Use the HHT to assign individual breakers to a particular group.

HHT Keys	Function
F1	Home screen key
F2	Quick access to status information
← →	Left and right arrow keys point to the desired field to be configured
↑ ↓	Up and down arrow keys scroll through all breakers on panel screens
Cancel	Deletes number you have chosen and changes it to zero, and cancels overrides on selected field
Enter	Saves changes (optional - use the down arrow)
-	Toggles between override ON and OFF
•	Toggles between override ON and OFF

Table 3-3 *- 8RO Mapping*

3.6.1.1. HHT Screens

The Home screen is the first screen that appears. Press F1 at any time to return to the Home screen:

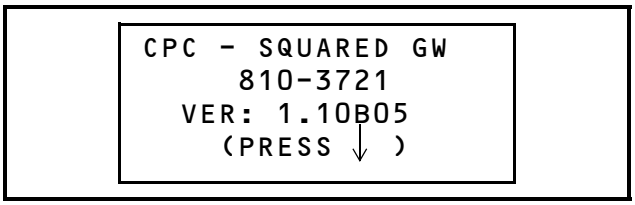


Figure 3-14 *- Home Screen*

Press the down arrow key to move to the Starting Board Addresses screen.

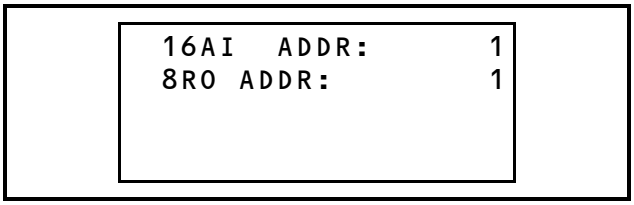


Figure 3-15 *- Starting Board Addresses Screen*

The Gateway emulates one 16AI and two 8ROs on the I/O Network. Set the 16AI and 8RO addresses using the left or right arrow keys to activate the corresponding fields, and number the boards accordingly. The 16AI address should be the first unused board number with a valid range of 1-16. The 8RO should be the next available 8RO I/O Network address with a valid range of 1-31.

For example, if you currently have three 16AIs and six 8ROs, set the 16AI address to 4 and the 8RO address to 7. If you add a 16AI and 8RO after the Gateway, set their addresses as follows: 16AI to 5 and the 8RO to 9.

Next, arrow down to the Option screen:

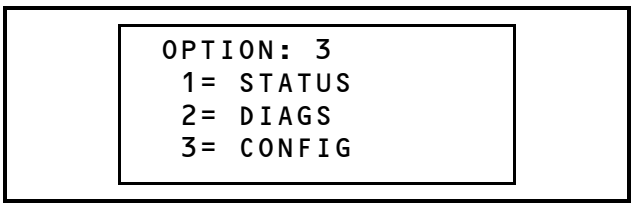


Figure 3-16 *- Option Screen*

Option No.	Function
1	Status information that can be overridden. (An asterisk "*" signifies a proof failure)
2	Diagnostics for troubleshooting
3	Configuration settings

Table 3-4 *- Option Choices Chart*

3.6.1.2. Configuration

Use the left or right arrows to activate the **OPTION:** field and choose the desired option number. (Select **3** to start configuring each Panel's breakers to groups.) Press the down arrow to move to the next screen.

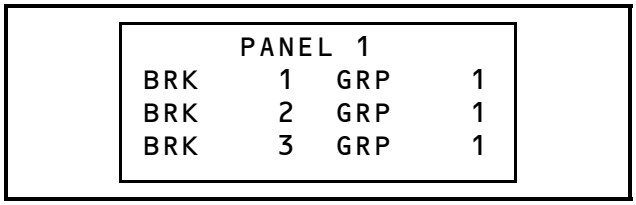


Figure 3-17 *- Panel 1 Breakers to Group Screen*

From this screen you can begin assigning breakers on panels 1 through 4 to breaker groups. Refer to ***Figure 1-1*** for a diagram of the Square D Powerlink panel and the numbered breaker addresses.

NOTE: The address numbers of the Square D panels do not correspond to what the HHT Gateway interface calls "panel numbers." The master panel is referred to in the HHT interface as "Panel #1," even though its network address is zero. Also, the panels addressed #1, #2, and #3 are referred to in the interface as Panel #2, Panel #3, and Panel #4 respectively.

Use the left and right arrow keys to configure the breaker's group number. Change the group number to the group you want to associate the breaker with (a maximum number of 16).

A group number field becomes active when you see the arrow appear next to the number. Use the down arrow key to scroll through all 42 breakers on each of the four panels and set the group numbers as you scroll through the breakers.

NOTE: If a breaker is assigned to a group that is not set up, a proof failure message will occur.

3.6.1.3. Status

From the Option screen, select **1** for Status. The Status screen shows the status of the 16 groups and shows the ON or OFF state of each group and any proof failures (a proof failure is indicated by "*" after the ON or OFF state). Press the down arrow key to scroll through the groups. After the groups are displayed, continue pressing the down arrow key to see the ON or OFF state and any proof failures of each of the 42 breakers and all panels.

If a group is not assigned or set to zero, a "-" will appear as the breaker status.

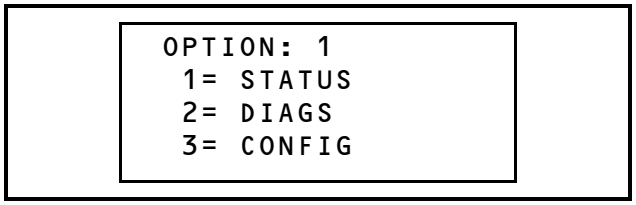


Figure 3-18 *- Option Screen*

4 Troubleshooting

Troubleshooting Square D Breaker Panels and the MODBUS Network

Problem: Square D Breaker Panel Offline

1. ***Check Wiring*** - Verify the Square D breaker panel is properly connected to the MODBUS cable. Verify the network polarity is correct (MODBUS 485+ to Square D terminal B, MODBUS 485- to Square D terminal A, MODBUS shield to terminal -) and there are no loose wires. If none of the Square D breaker panels are online, check wiring connections on the E2. Check the cable jackets to make sure all network cable is Belden #8761 or equivalent.
2. ***Verify MODBUS Port Setup*** - Press Alt+M on the E2 front panel. Verify COM2, COM4, or COM6 is set up as a MODBUS port. If so, verify that the MODBUS cable is connected to the proper connectors. Verify the COM port fields (***Figure 2-2***) are properly set for ECT MODBUS (19.2k baud, data size=8 bits, Parity=NONE, stop bits=1).
3. ***Check Square D Breaker Panel Slave Address Selector Numbering*** - Verify that the slave selector matches the “address selector” parameter under the Devices tab in E2.
4. ***Verify Slave Bus Interconnect Cable*** - For panels with both L and R rails, verify the slave bus interconnect cable is connected to one end to the L and the other to the R. Both ends of the cable are connected to both the L and R rails.
5. ***Verify 4 Conductor Wiring Between The Master Panel And Slave Panels*** - Verify the B A - + polarity is consistent from master to slave panels, and the max length does not exceed 400 ft (100 feet for 220V panels).
6. ***Check Network Termination*** - The two devices on either end of the MODBUS network should be terminated, with all other devices in the daisy chain unterminated. Check jumper settings for all devices on the network.

5 Worksheets

5.1. Breaker Group Assignment

Use the workspace below to assign breakers to groups. If using the Gateway board, refer to ***Table 5-3*** for group number board and point assignment.

Panel 1 Breakers		Panel 2 Breakers		Panel 3 Breakers		Panel 4 Breakers	
Group#	Group#	Group#	Group#	Group#	Group#	Group#	Group#
1 ___	22 ___	1 ___	22 ___	1 ___	22 ___	1 ___	22 ___
2 ___	23 ___	2 ___	23 ___	2 ___	23 ___	2 ___	23 ___
3 ___	24 ___	3 ___	24 ___	3 ___	24 ___	3 ___	24 ___
4 ___	25 ___	4 ___	25 ___	4 ___	25 ___	4 ___	25 ___
5 ___	26 ___	5 ___	26 ___	5 ___	26 ___	5 ___	26 ___
6 ___	27 ___	6 ___	27 ___	6 ___	27 ___	6 ___	27 ___
7 ___	28 ___	7 ___	28 ___	7 ___	28 ___	7 ___	28 ___
8 ___	29 ___	8 ___	29 ___	8 ___	29 ___	8 ___	29 ___
9 ___	30 ___	9 ___	30 ___	9 ___	30 ___	9 ___	30 ___
10 ___	31 ___	10 ___	31 ___	10 ___	31 ___	10 ___	31 ___
11 ___	32 ___	11 ___	32 ___	11 ___	32 ___	11 ___	32 ___
12 ___	33 ___	12 ___	33 ___	12 ___	33 ___	12 ___	33 ___
13 ___	34 ___	13 ___	34 ___	13 ___	34 ___	13 ___	34 ___
14 ___	35 ___	14 ___	35 ___	14 ___	35 ___	14 ___	35 ___
15 ___	36 ___	15 ___	36 ___	15 ___	36 ___	15 ___	36 ___
16 ___	37 ___	16 ___	37 ___	16 ___	37 ___	16 ___	37 ___
17 ___	38 ___	17 ___	38 ___	17 ___	38 ___	17 ___	38 ___
18 ___	39 ___	18 ___	39 ___	18 ___	39 ___	18 ___	39 ___
19 ___	40 ___	19 ___	40 ___	19 ___	40 ___	19 ___	40 ___
20 ___	41 ___	20 ___	41 ___	20 ___	41 ___	20 ___	41 ___
21 ___	42 ___	21 ___	42 ___	21 ___	42 ___	21 ___	42 ___

Table 5-1 *- Assign Breakers to Group Numbers*

5.2. Gateway Board Group to Point Number Calculation

This worksheet is for mapping breaker group numbers to board and points (**Bd**:**Pt**). Up to a maximum of 16 groups can be set up, but an unlimited amount of breakers can be assigned to any given group.

Table 5-2 shows the correlation between the group numbers and the virtual 16AI and 8RO points of the Gateway. *Y* represents the 16AI address and *X* represents the 8RO address of the Gateway configured in **Section 3.6.1.1.*, *HHT Screens*** as shown in ***Figure 3-15***.

Light Schedule Group	Proof In (Bd) 16AI Addr	Proof In (Pt) 16AI Points	Lights Output (Bd) 8RO Addr	Lights Output (Pt) 8RO Points
1	*Y*	1	*X*	1
2	*Y*	2	*X*	2
3	*Y*	3	*X*	3
4	*Y*	4	*X*	4
5	*Y*	5	*X*	5
6	*Y*	6	*X*	6
7	*Y*	7	*X*	7
8	*Y*	8	*X*	8
9	*Y*	9	*X+1*	1
10	*Y*	10	*X+1*	2
11	*Y*	11	*X+1*	3
12	*Y*	12	*X+1*	4
13	*Y*	13	*X+1*	5
14	*Y*	14	*X+1*	6
15	*Y*	15	*X+1*	7
16	*Y*	16	*X+1*	8

Table 5-2 *- Mapping Group Numbers to Point Numbers*

5.3. Gateway Board Group to Point Number Mapping

16AI Address = ____ Fill in the Gateway 16AI board address that you set with the HHT.

8RO Address = ____Fill in the Gateway 8RO board address that you set with the HHT for Groups 1-8. For Groups 9-16, use the next consecutive 8RO board address (add 1).

Light Sched-ule	Proof In (Bd)	Proof In (Pt)	Lights Output (Bd)	Lights Output (Pt)	Group Name
Group	**16AI Addr**	**16AI Points**	**8RO Addr**	**8RO Points**	
1		1		1	
2		2		2	
3		3		3	
4		4		4	
5		5		5	
6		6		6	
7		7		7	
8		8		8	
9		9		1	
10		10		2	
11		11		3	
12		12		4	
13		13		5	
14		14		6	
15		15		7	
16		16		8	

Table 5-3 *- Mapping Group Numbers to Point Numbers*